Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/371
USSR
February 1964
Original: RUSSIAN

Confidential until official release during Conference

Abstract

NUCLEAR POWER PLANT DYNAMIC STABILITY

P.A.Gavrilov, L.N.Podlazov.

Stability of nuclear power plants with a steam generator operating at a free level is considered when turbogenerator load and reactivity are changing.

A dynamic equation system is given and confirmed. Transfer functions for several parameters (in particular, power and pressure) are obtained in the form suitable for different modes of regulation including self-regulation.

It is shown that in most practically interesting cases transfer functions may be used as fractional rational functions with a characteristic equation of not higher than the fifth power.

A method of defining plant general parameters is presented ensuring a plant aperiodic stability with load and reactivity perturbations.

Nomograms are given to determine the plant dynamic characteristics (characteristic equation roots, decrements of attenuation, oscillation frequencies etc.). The nomograms may be directly used to select optimal characteristics and analyse dynamics of designed reactor and control systems.

As an example, the model developed is applied to the analysis of the АРБУС dynamics.

It is shown that the АРБУС dynamic parameters are in the vicinity of the aperiodic stability boundary when turbogenerator

Translation provided by courtesy of the submitting Government

load is changing. Some recommendations are given aiming at improving dynamic characteristics of the plant.

The results of the АРБУС dymanics on an analog computer are compared with those on nomograms.

A choice of regulation model of the АРБУС is provided.

It is proved that there is no need for an automatic power regulator (AP) and that it is possible to operate nuclear power plants at a self-regulation régime.